

PROTEGO® Braunschweiger Flammenfilter GmbH

Excellence in Safety and Environment

Explosion Protection through the Use of Flame Arresters

Michael Geipel, Senior Project and Sales Engineer

December 2023



for safety and environment

PROTEGO® Products

- Flame Arresters
- Pressure and Vacuum Relief Valves
- Tank equipment



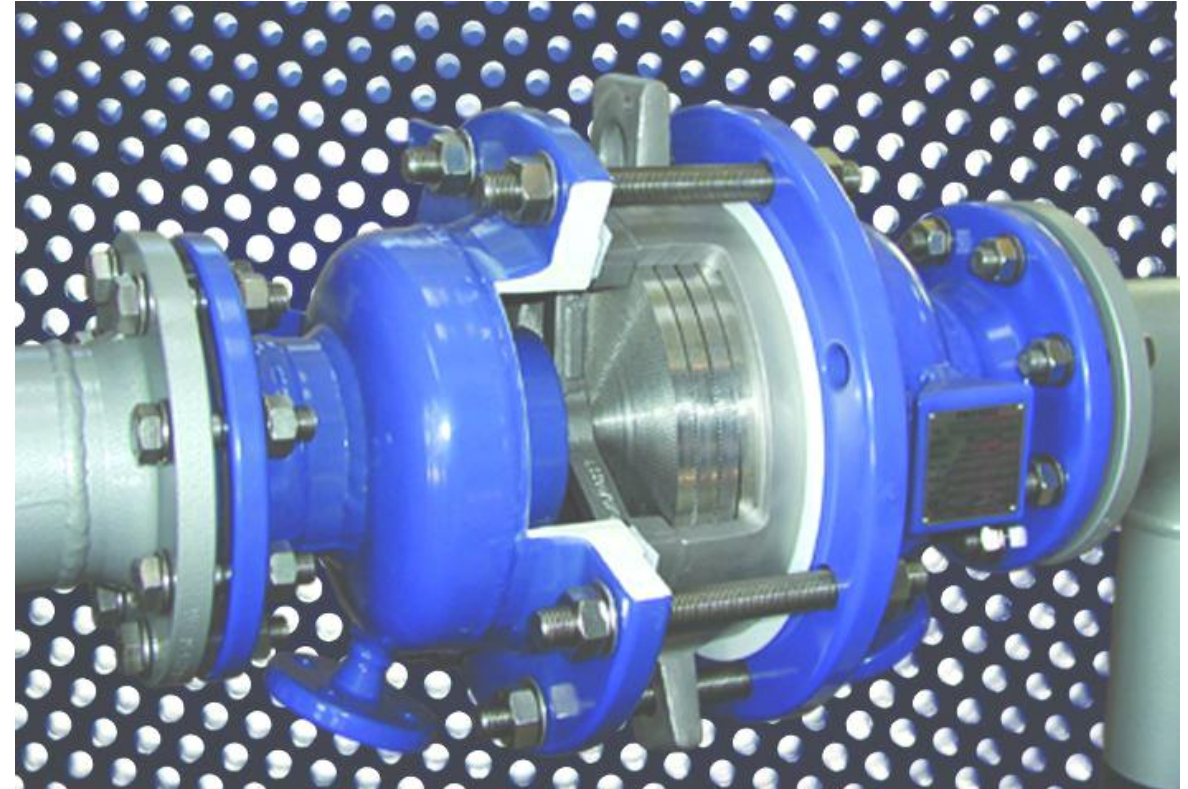
Agenda

- 1 Flame Arrester Function and Types
- 2 Storage and Handling of Flammable Liquids

Flame Arrester

ISO 16852:

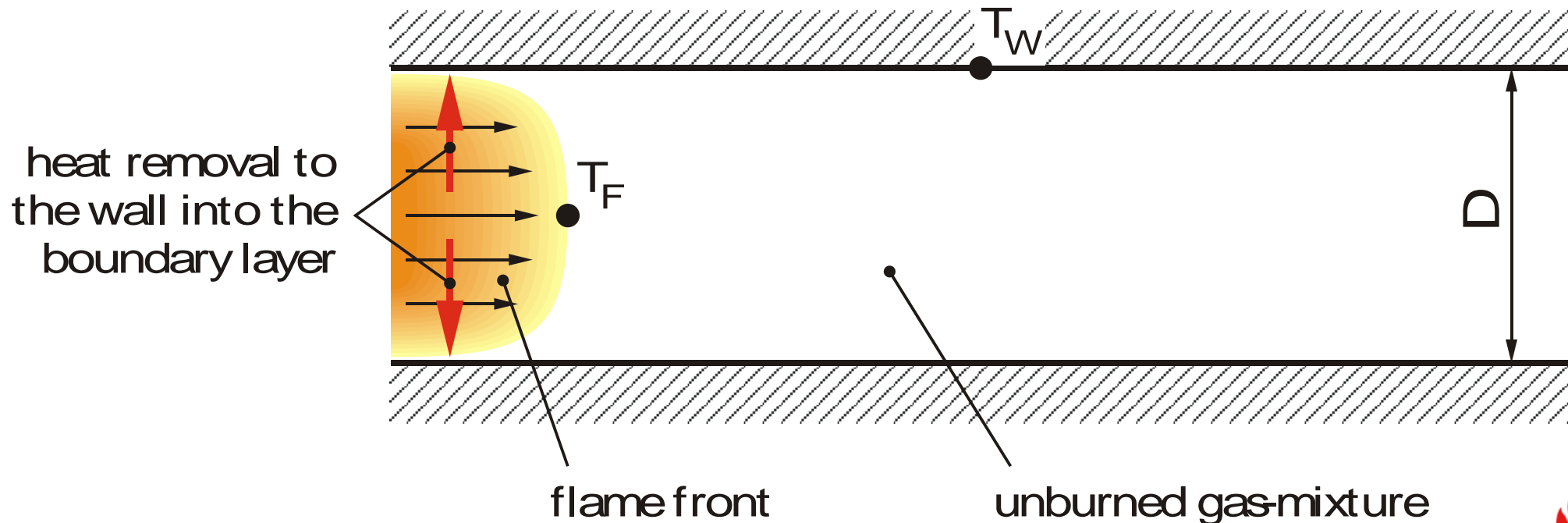
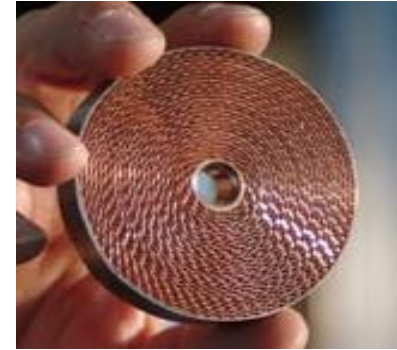
A flame arrester is a device ... whose intended function is to allow flow but prevent the transmission of flame.



Principle of „flame quenching“

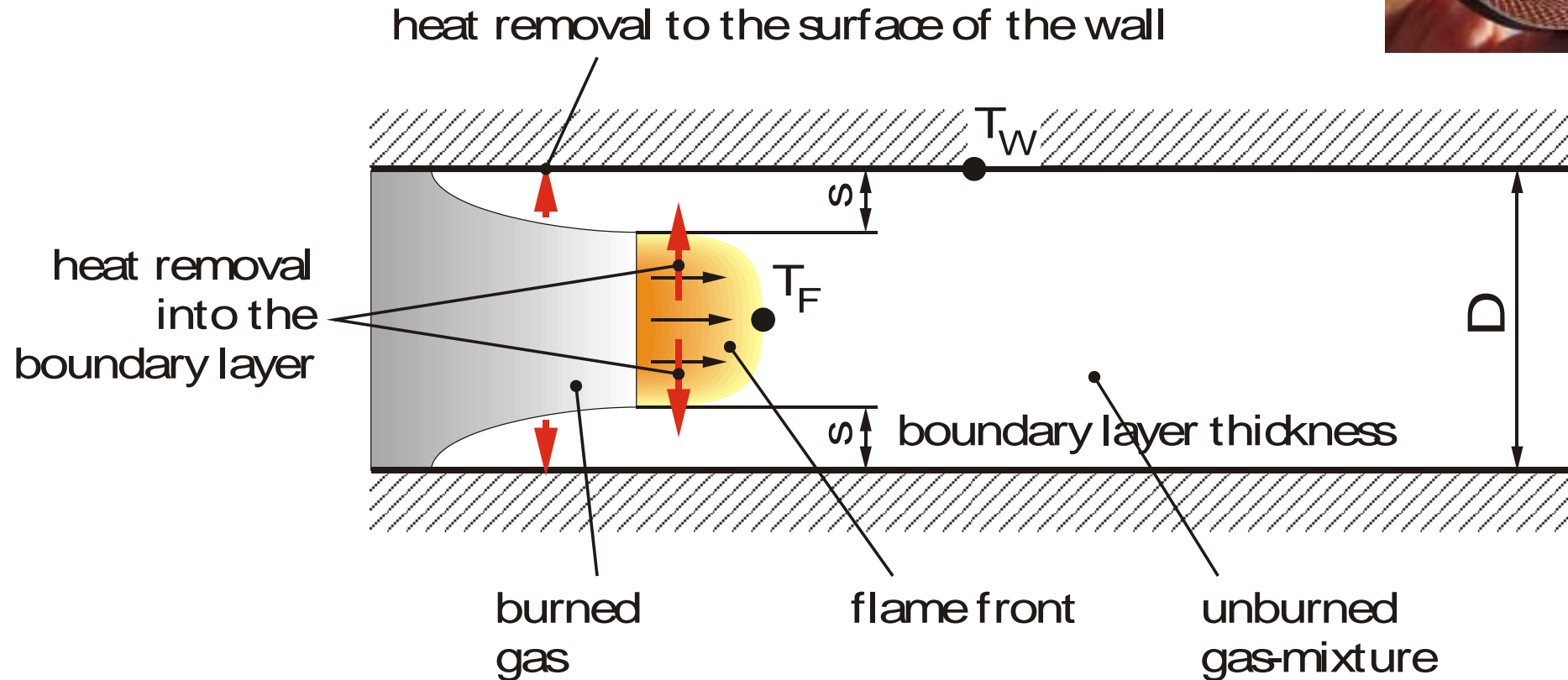
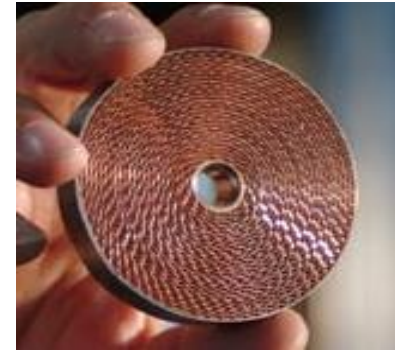
Function of a static flame arrester:

Where does the heat remain?



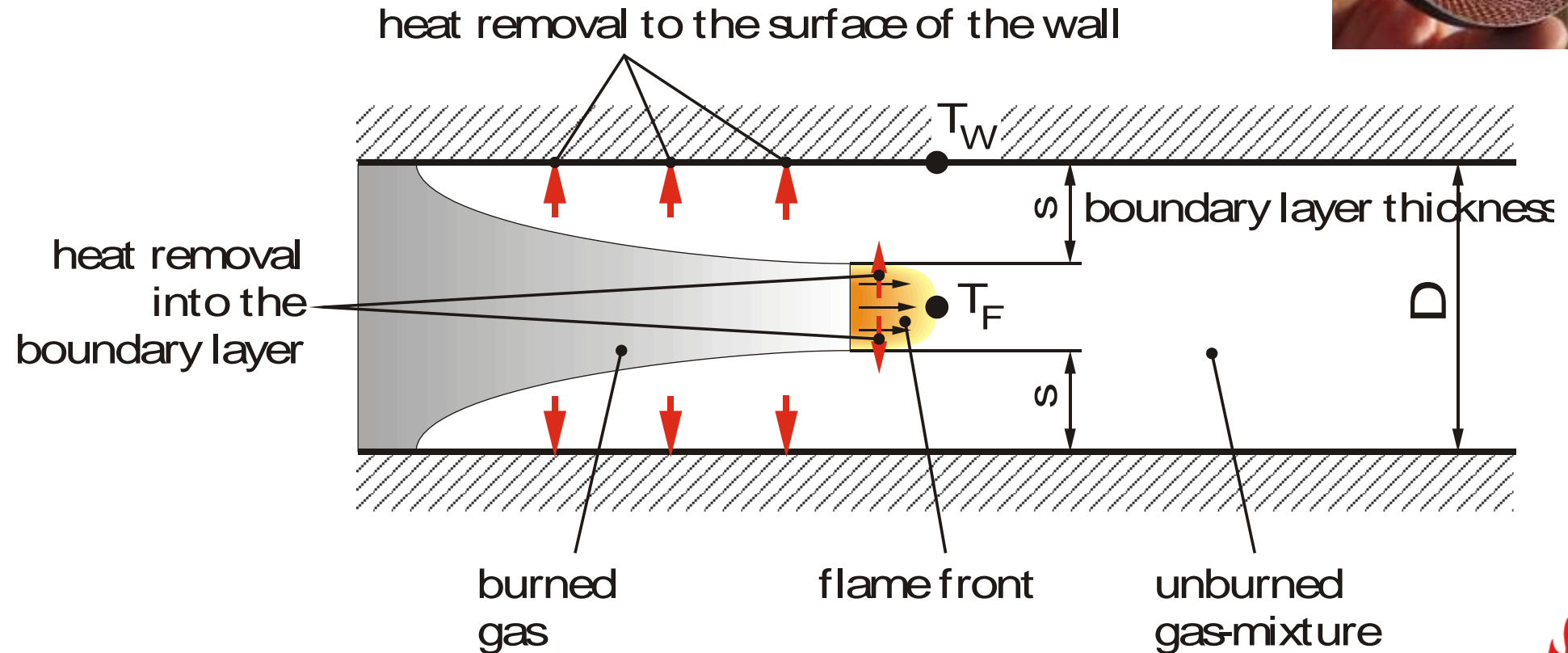
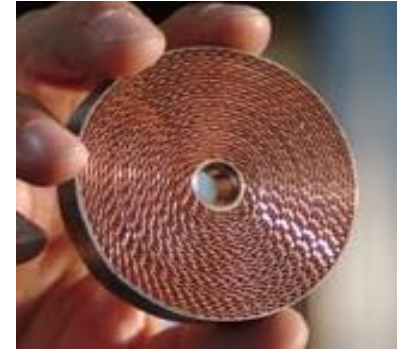
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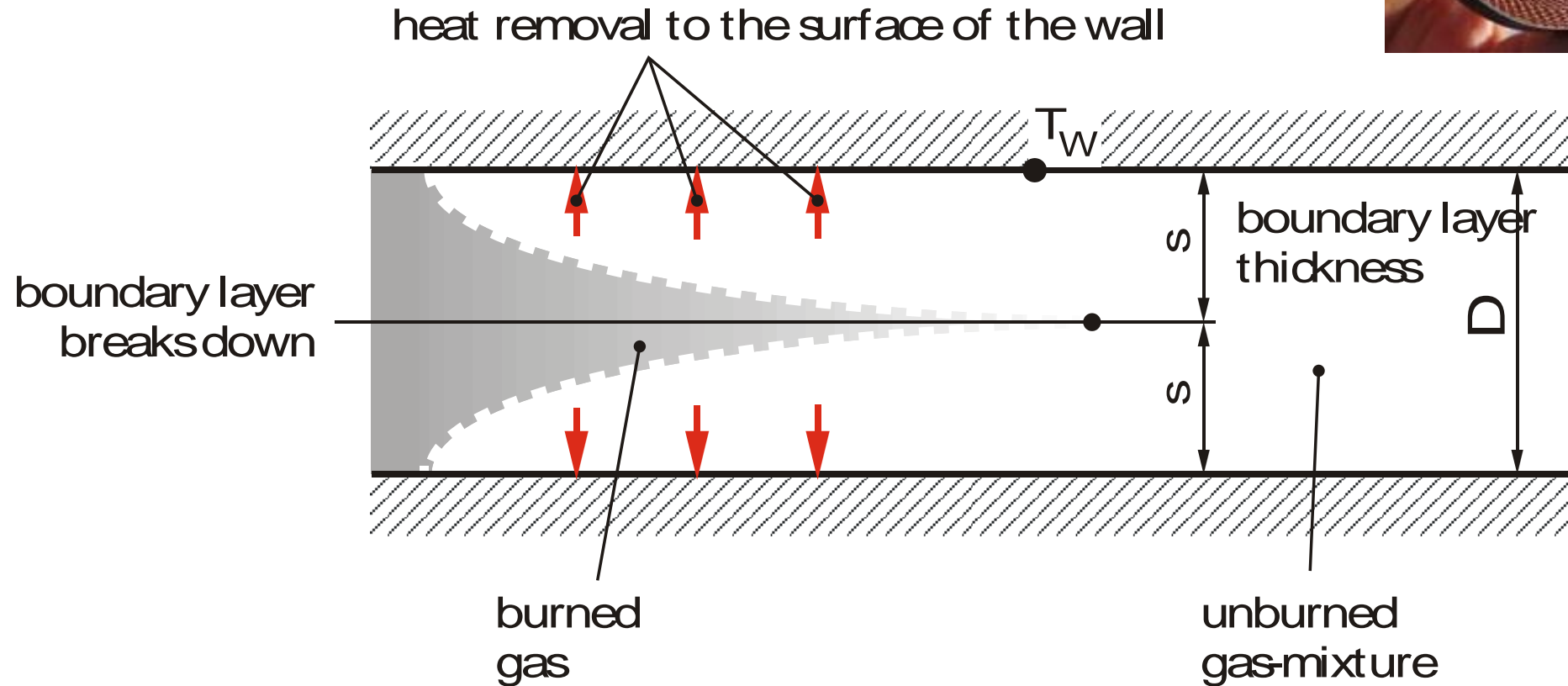
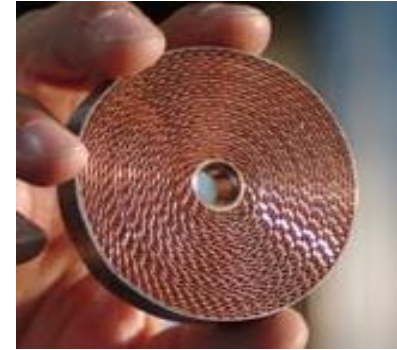
Principle of „flame quenching“

Where does the heat remain?



Principle of „flame quenching“

Where does the heat remain?



Deflagration - Detonation



Explosion Groups



Braunschweiger Flammenfilter GmbH

DEFLAGRATION TESTS

DN 1000

$L/D = 18$

Versuchs- und Entwicklungszentrum Lehre



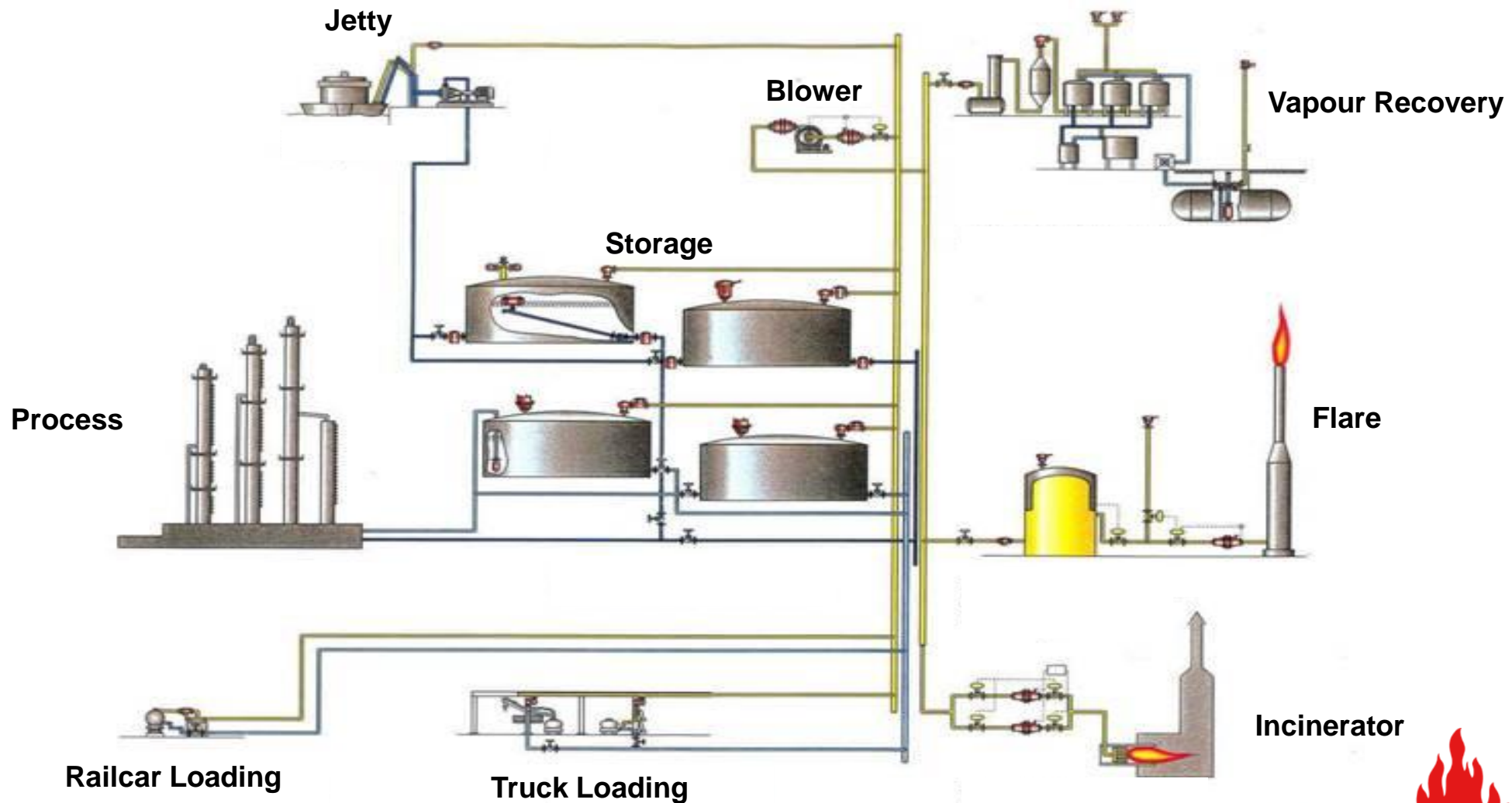
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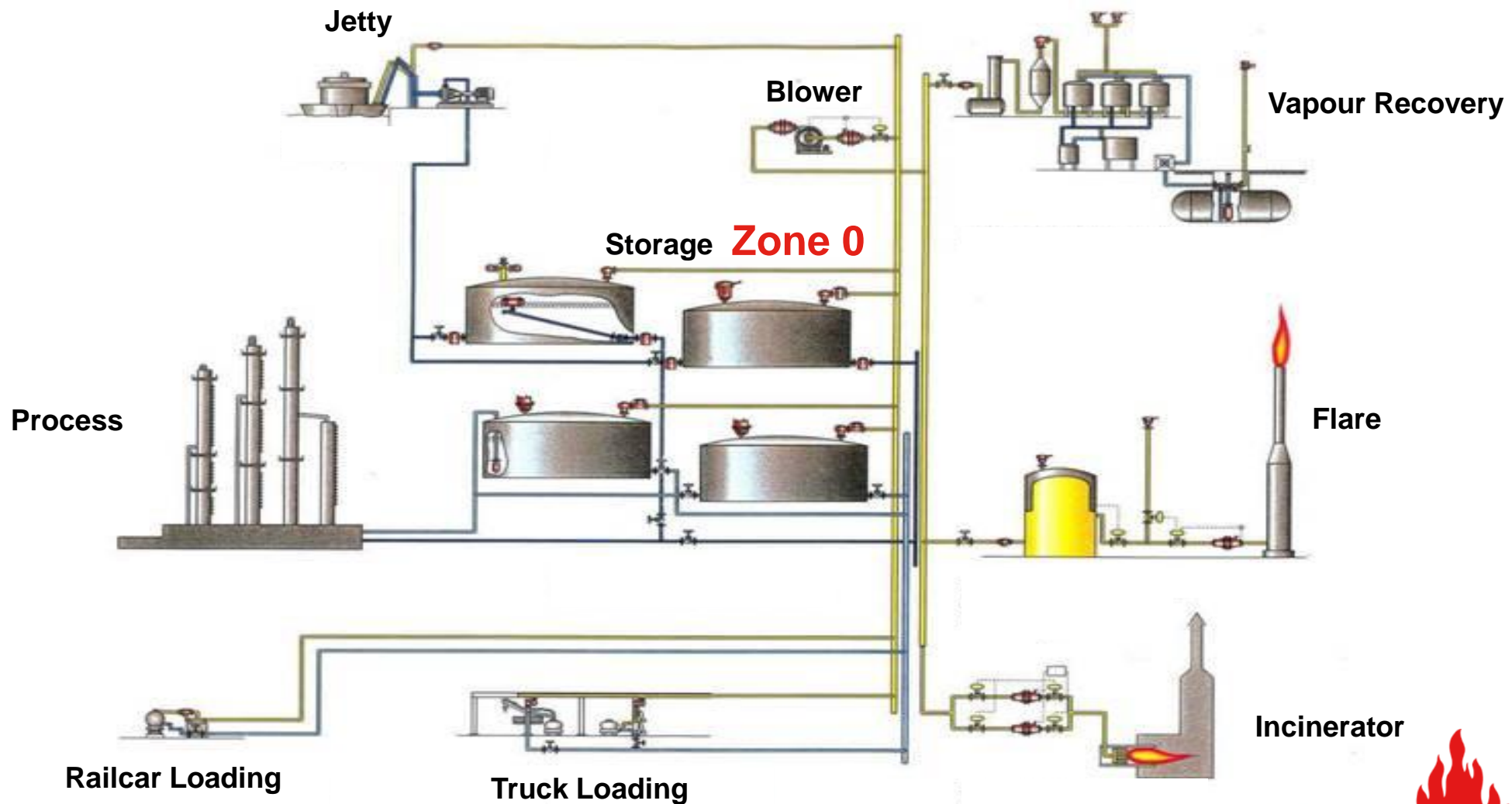
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2 Storage and Handling of Flammable Liquids

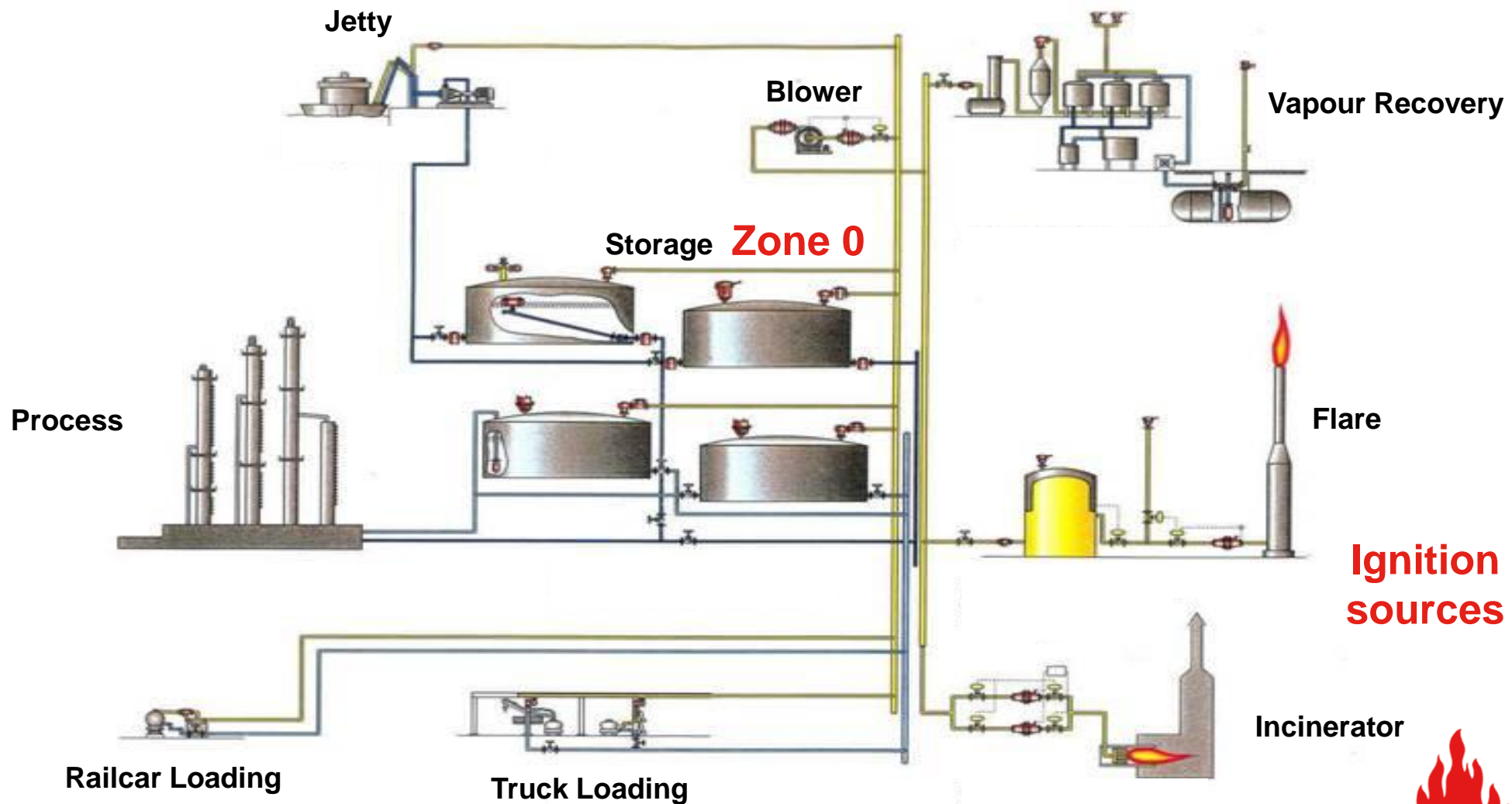
Storage and Handling of Flammable Liquids



Storage and Handling of Flammable Liquids



Storage and Handling of Flammable Liquids



Constructional Explosion Protection

- Explosion-pressure resistant / explosion-pressure-shock resistant design (DIN EN 14460)
 - atmospheric vapour piping \leq DN200: PN10 (TRGS 509)
 - atmospheric vapour piping $>$ DN200: PN16 (TRGS 509)
- Explosion venting
- explosion suppression (DIN EN 14373)
 - Detection of explosion
 - Flame extinguishing with extinguishing mediums
- Explosion decoupling (Prevention of explosion propagation)
 - Product barriers (liquid barriers)
 - **Flame arresters** (DIN EN ISO 16852)



Safety Concept

Tank



Incinerator



Safety Concept (CEN/TR 16793, NFPA 69, TRGS 509)

Number of independent measures against flame transmission (Layers of protection)

ignition source	zone 0	zone 1	zone 2	
	explosive atmosphere			
	permanent	sometimes	rare	never (non-hazardous area)
permanent	3	2	1	0
sometimes	2	1	0	-
rare	1	0	-	-
never	0	-	-	-

Safety Concept (CEN/TR 16793, NFPA 69, TRGS 509)

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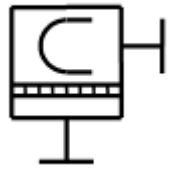
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for safety and environment

Layers of Protection

1) Flame Arrestor



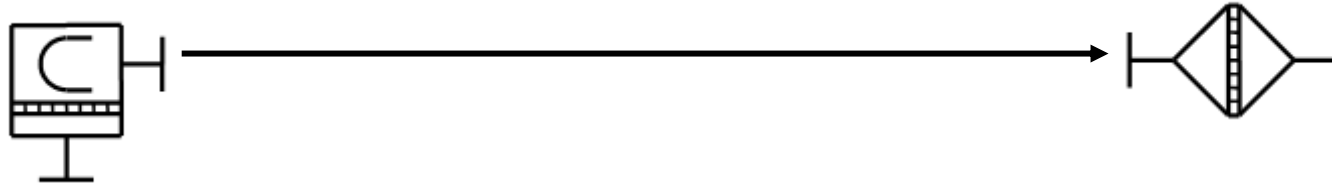
1) Flame Arrestor (Detonation)



Layers of Protection

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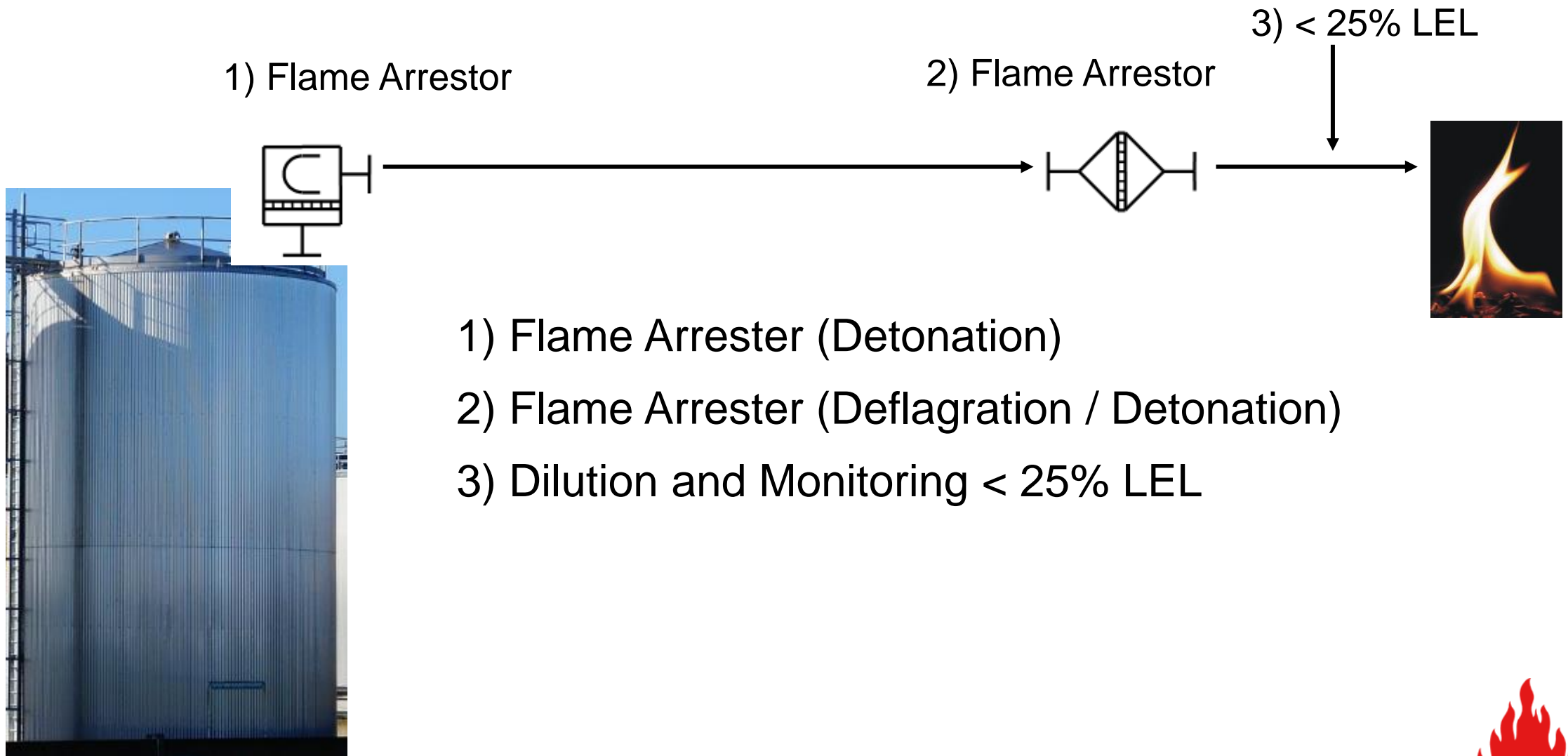
2) Flame Arrestor



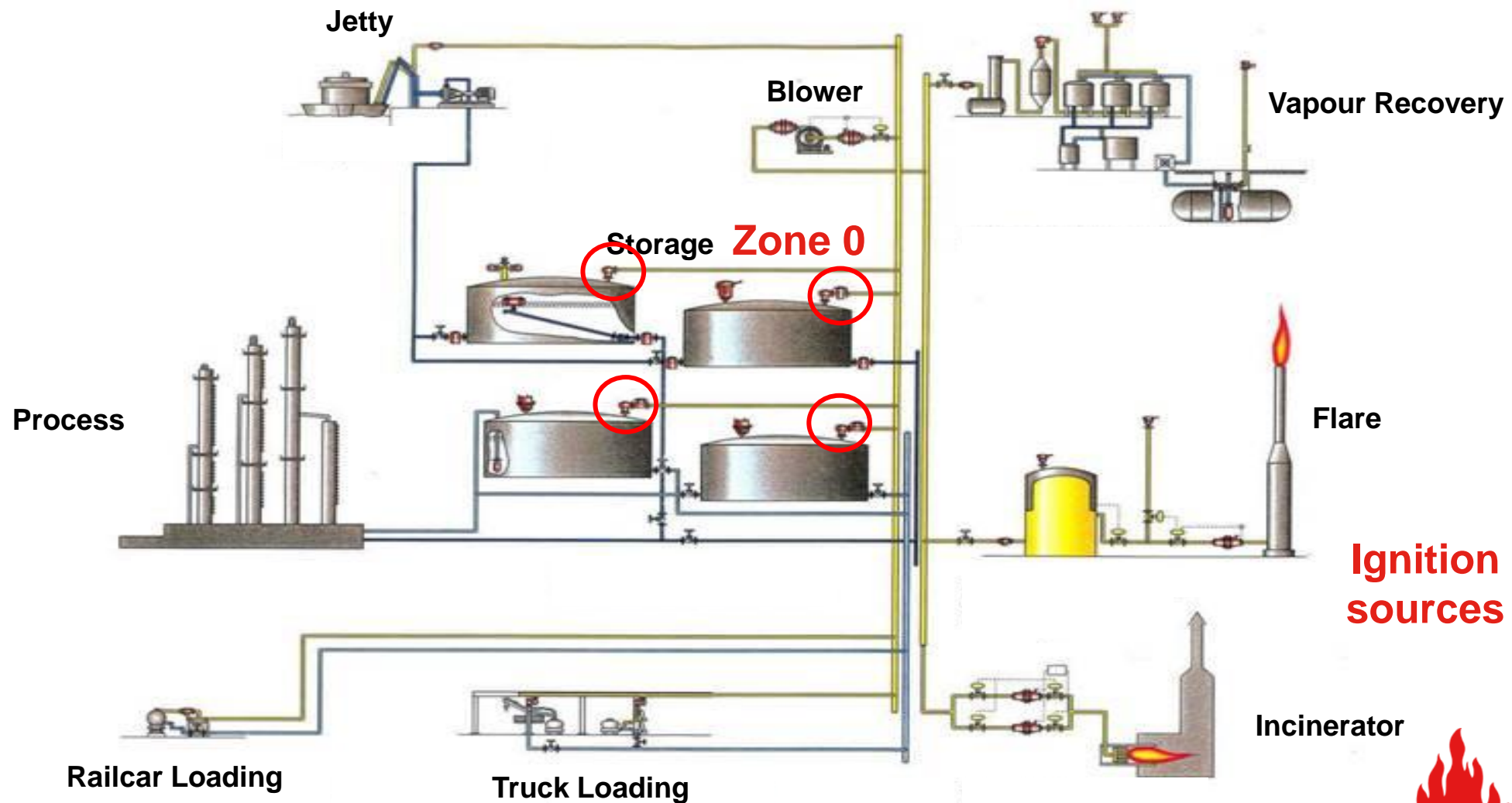
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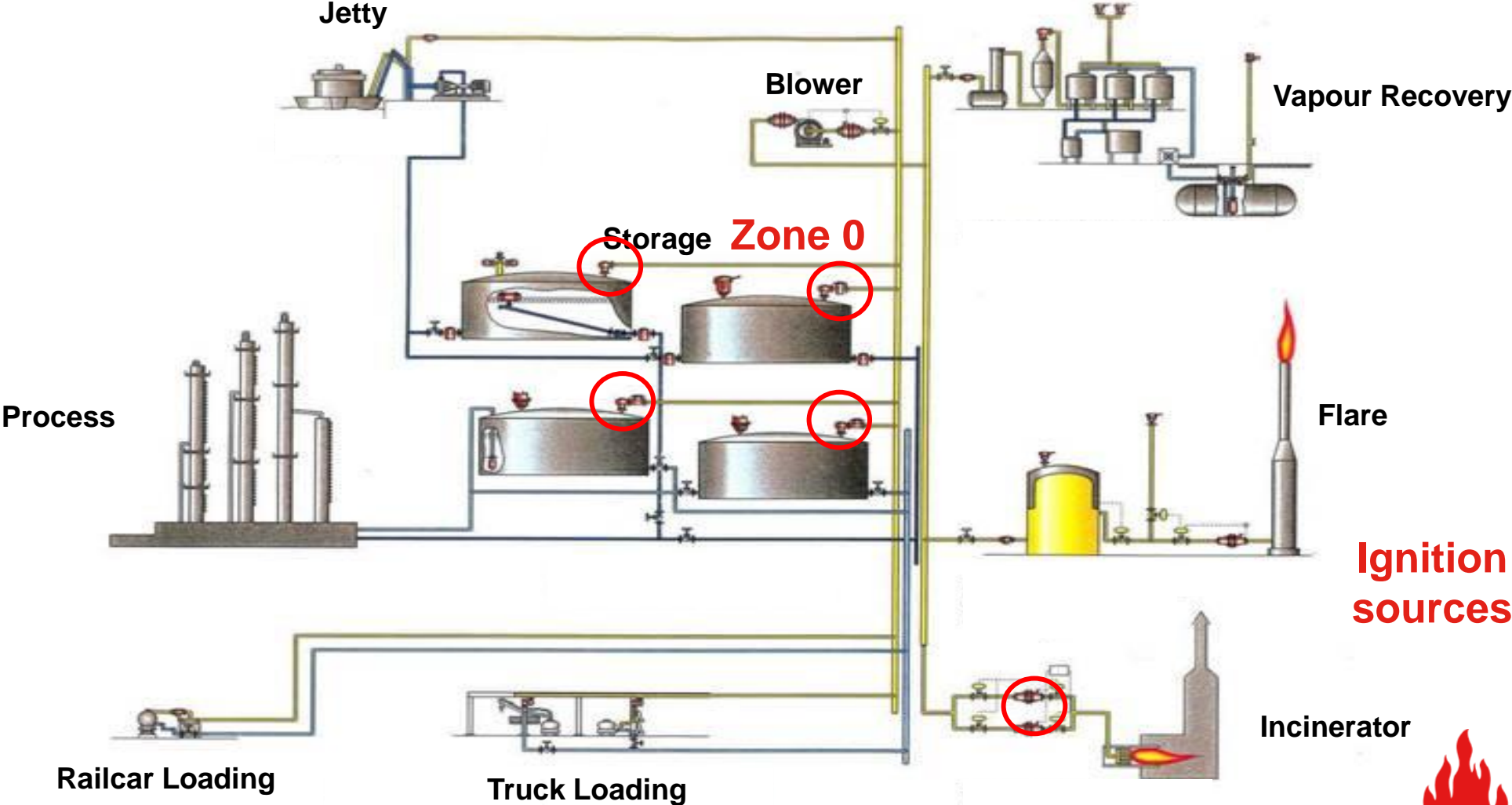
Layers of Protection



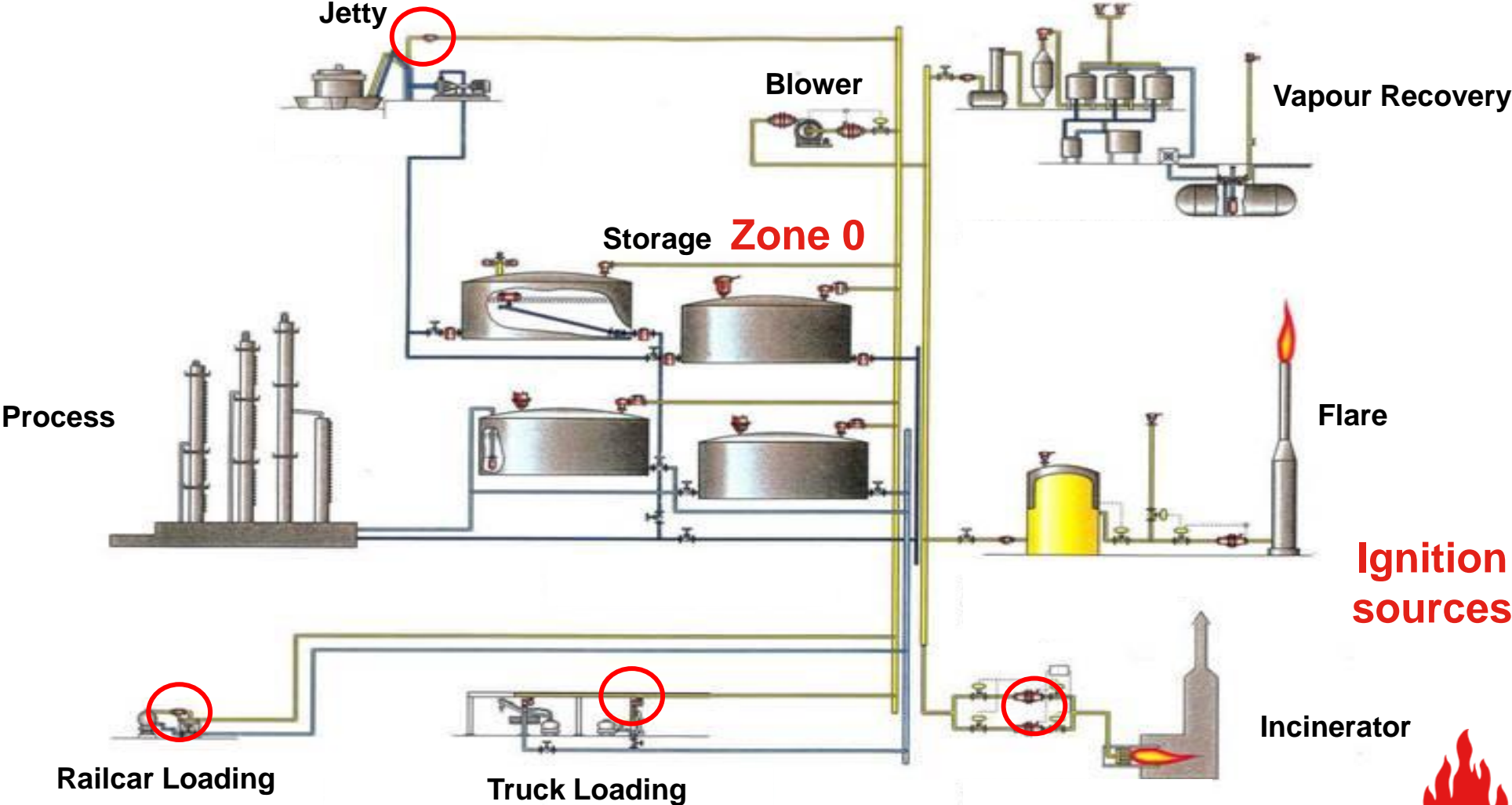
Storage and Handling of Flammable Liquids



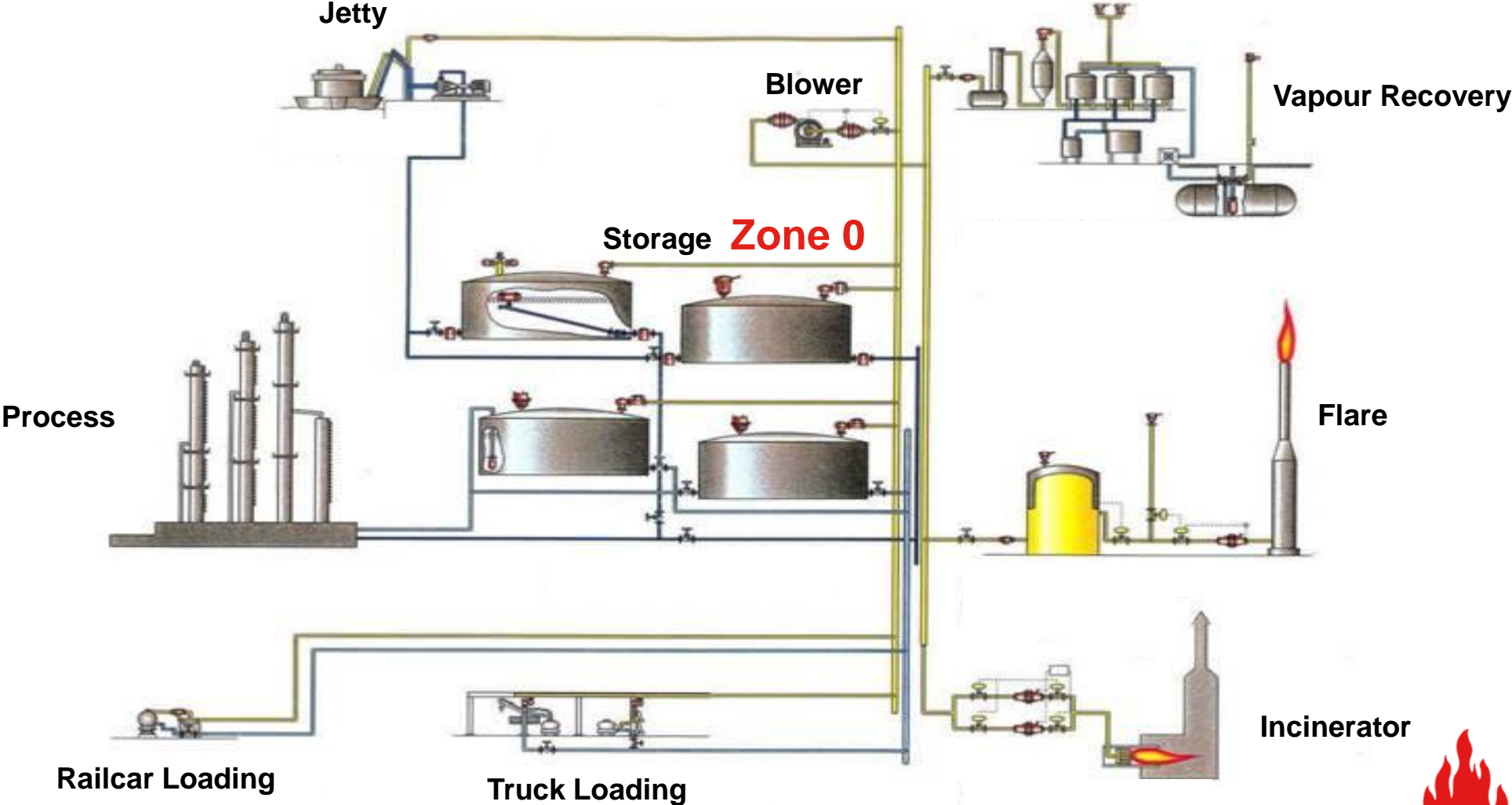
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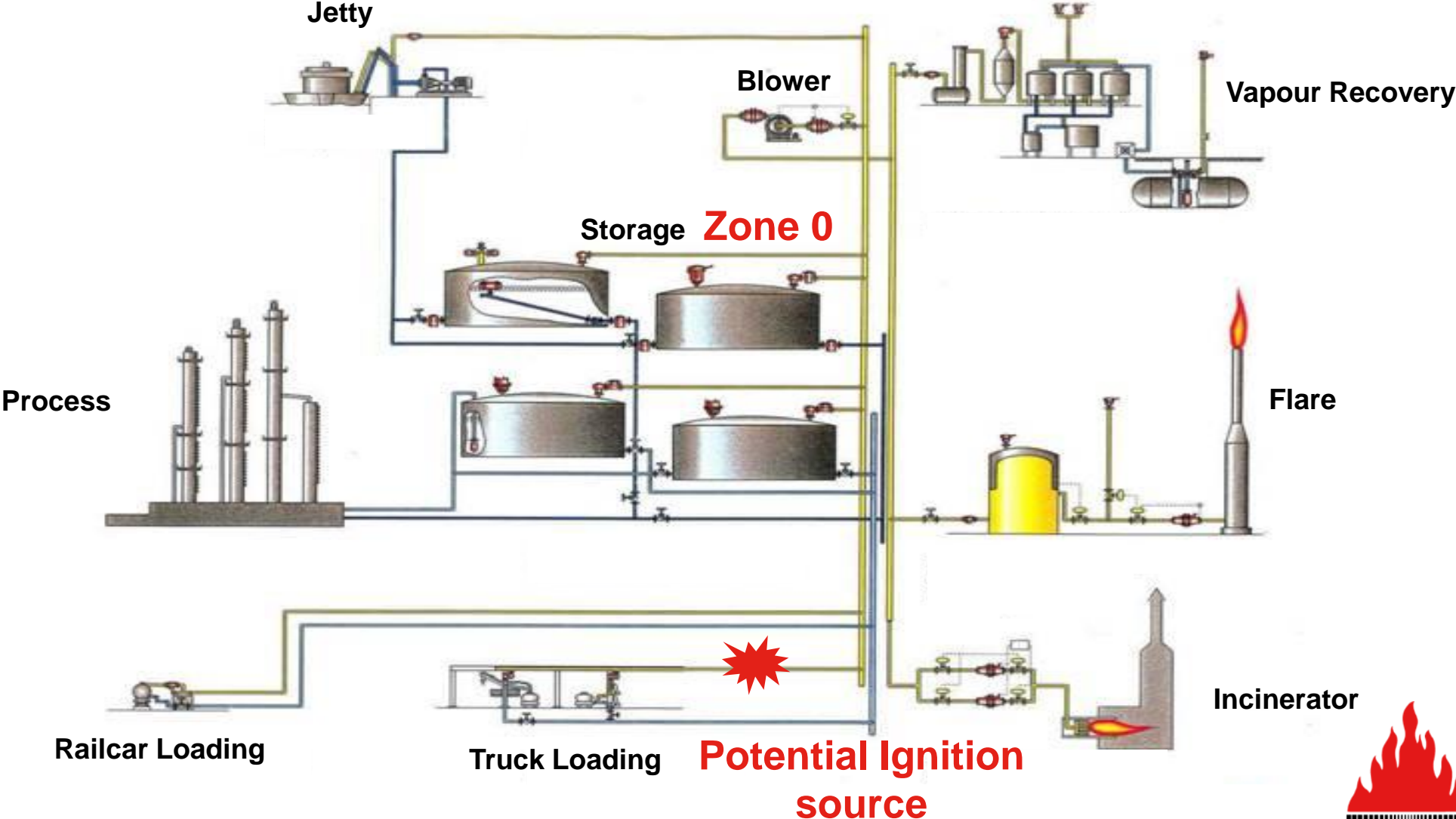
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Ignition Sources

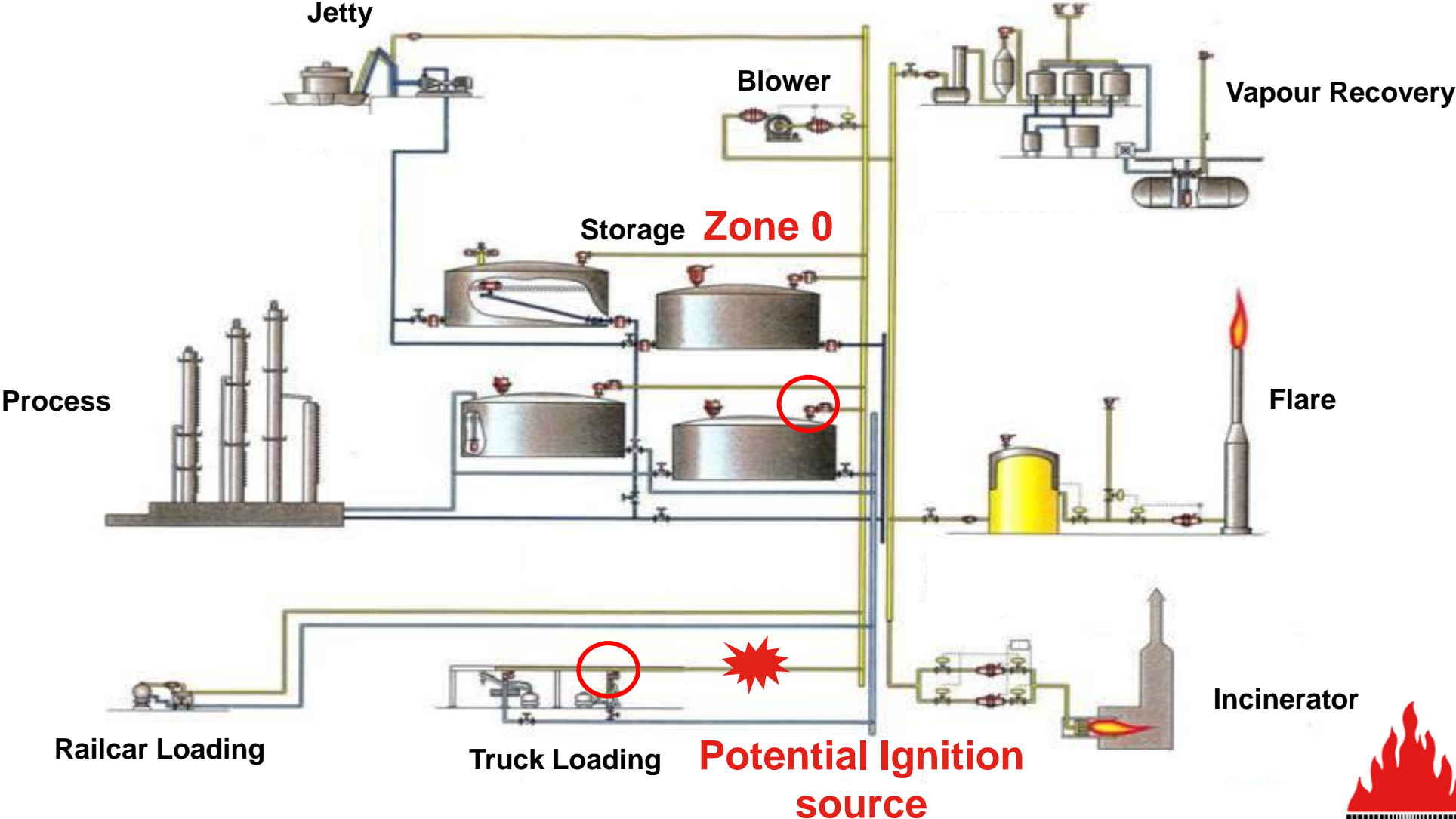


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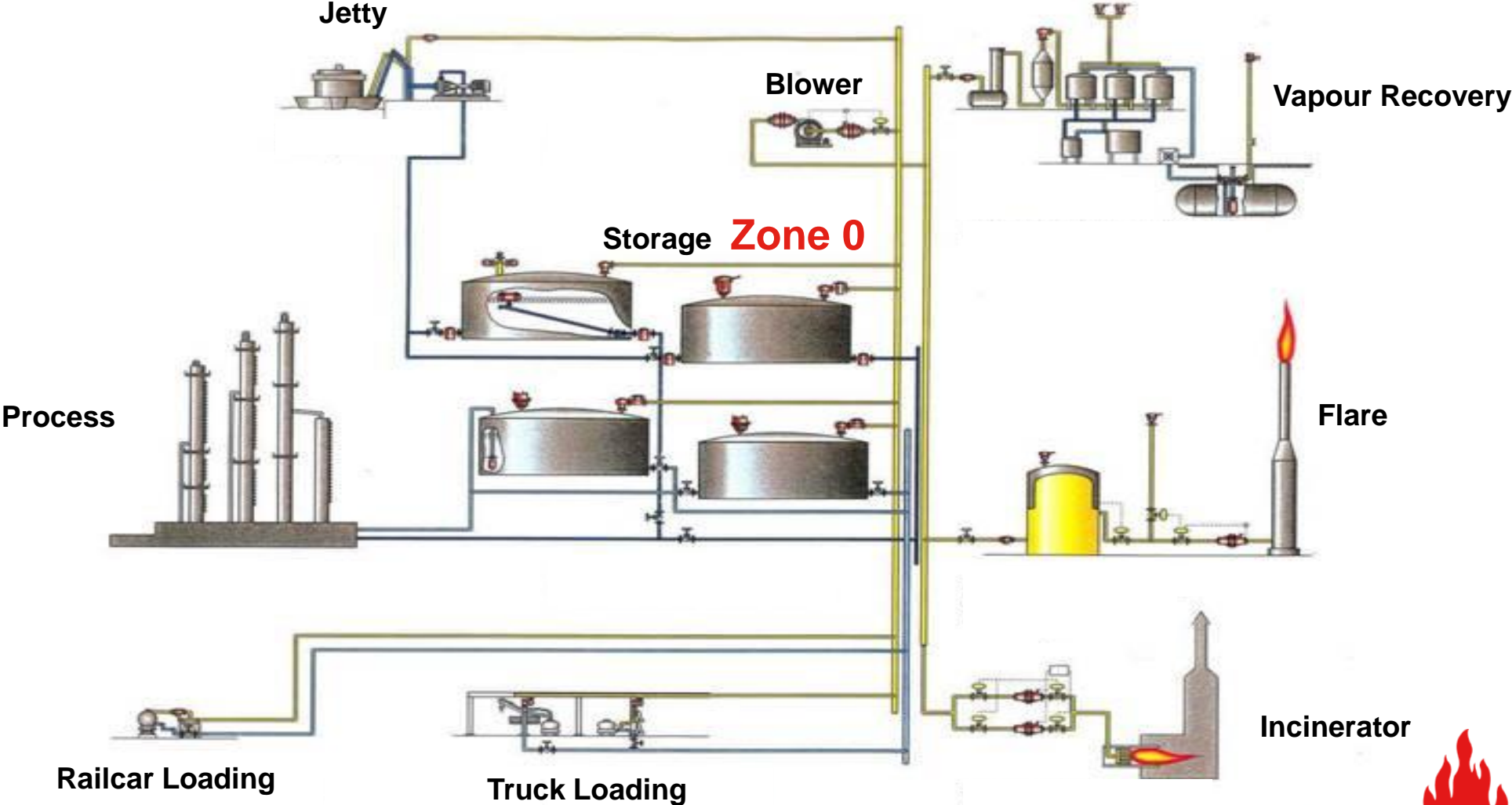
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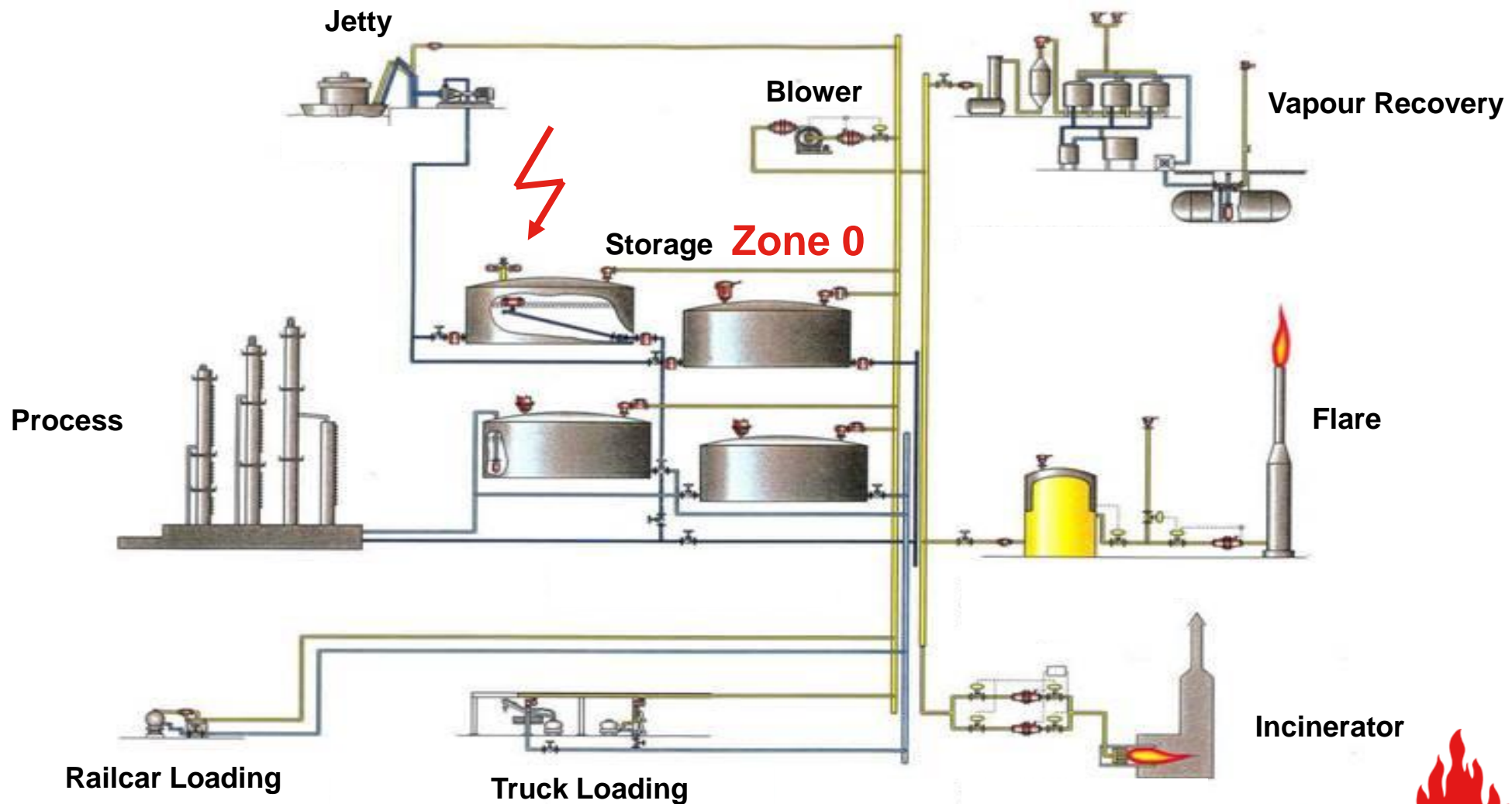
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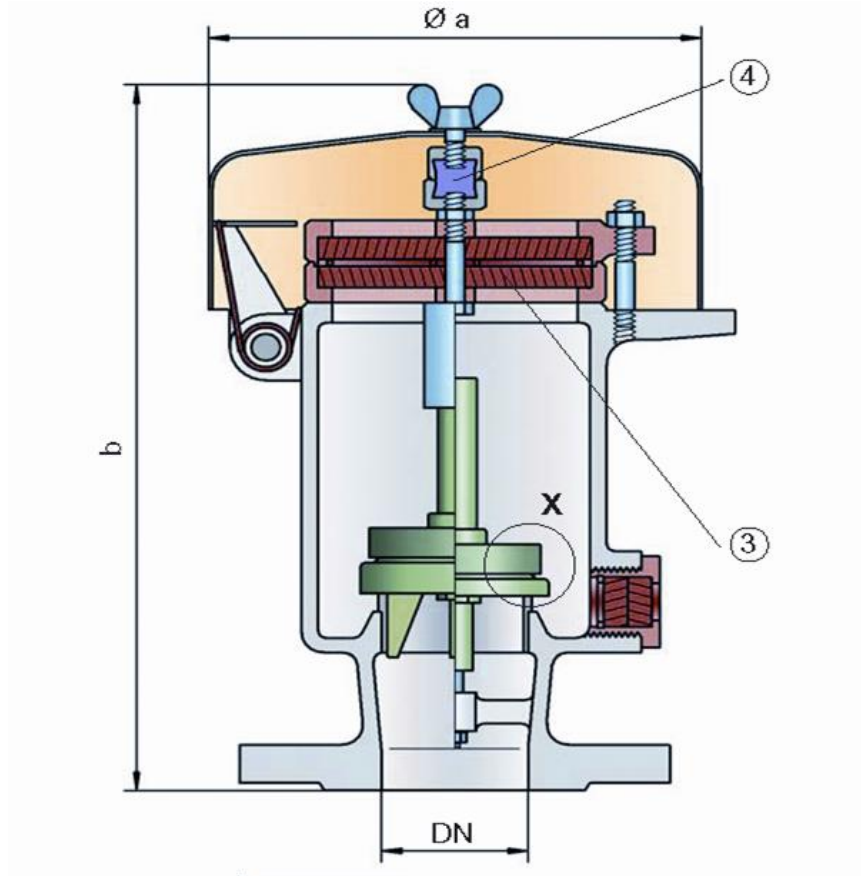
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Storage and Handling of Flammable Liquids




Vent Valves with integrated Flame Arresters





Thank you for your kind attention!



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